United Nations

Framework Convention on Climate Change

FCCC/ARR/2014/BGR

Distr.: General
14 April 2015

English only

Report on the individual review of the annual submission of Bulgaria submitted in 2014*

* In the symbol for this document, 2014 refers to the year in which the inventory was submitted, and not to the year of publication.

GE.15-07781 (E)

1507781

Please recycle

Contents

		Paragraphs	*Page*
I.	Introduction and summary	1–6	3
II.	Technical assessment of the annual submission	7–106	7
	A. Overview	7–20	7
	B. Energy	21–31	11
	C. Industrial processes and solvent and other product use	32–47	13
	D. Agriculture	48–62	17
	E. Land use, land-use change and forestry	63–69	21
	F. Waste	70–86	22
	G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol	87–106	25
III.	Conclusions and recommendations	107–108	30
	A. Conclusions	107	30
	B. Recommendations	108	31
IV.	Questions of implementation	109	35
Annexes			
I.	Information to be included in the compilation and accounting database		36
II.	Documents and information used during the review		41
III.	Acronyms and abbreviations		43

I. Introduction and summary

1. This report covers the review of the 2014 annual submission of Bulgaria, coordinated by the UNFCCC secretariat, in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines). The review took place from 22 to 27 September 2014 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Simon Eggleston (United Kingdom of Great Britain and Northern Ireland) and Mr. Riccardo de Lauretis (Italy); energy – Mr. Kennedy Amankwa (Ghana), Ms. Emilia Hanley (Ireland), Mr. Michael Smith (New Zealand) and Mr. Hongwei Yang (China); industrial processes and solvent and other product use – Mr. Samir Tantawi (Egypt) and Mr. David Thistlethwaite (United Kingdom); agriculture – Ms. Savitri Garivait (Thailand) and Mr. Steen Gyldenkærne (Denmark); land use, land-use change and forestry (LULUCF) – Ms. Andrea Brandon (New Zealand), Mr. Hung Dinh Nguyen (Viet Nam) and Mr. Xiaoquan Zhang (China); and waste – Ms. Juliana Bempah (Ghana) and Ms. Katja Pazdernik (Austria). Ms. Bempah and Mr. Eggleston were the lead reviewers. The review was coordinated by Mr. Vlad Trusca (UNFCCC secretariat).

2. In accordance with the Article 8 review guidelines, a draft version of this report was sent to the Government of Bulgaria, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified.

3. All recommendations and encouragements included in this report are based on the expert review team's (ERT's) assessment of the 2014 annual submission against the Article 8 review guidelines. The ERT has not taken into account the fact that Parties will prepare the submissions due by 15 April 2015 using the revised "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" adopted through decision 24/CP.19. Therefore, when preparing the next annual submissions, Parties should evaluate the implementation of the recommendations and encouragements in this report, in the context of those guidelines.

4. In 2012, the main greenhouse gas (GHG) emitted by Bulgaria was carbon dioxide (CO_2), accounting for 78.9 per cent of total GHG emissions[1] expressed in carbon dioxide equivalent (CO_2 eq), followed by methane (CH_4) (11.7 per cent) and nitrous oxide (N_2O) (8.6 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.8 per cent of the overall GHG emissions in the country. The energy sector accounted for 77.0 per cent of total GHG emissions, followed by the agriculture sector (10.7 per cent), the industrial processes sector (6.4 per cent), the waste sector (5.9 per cent) and the solvent and other product use sector (0.1 per cent). Total GHG emissions amounted to 61,259.08 Gg CO_2 eq and decreased by 50.0 per cent between the base year[2] and 2012. The ERT concluded that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of carbon dioxide equivalent excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1988 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from source categories included in Annex A to the Kyoto Protocol only.

5. Tables 1 and 2 show GHG emissions from source categories included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively.

6. Information to be included in the compilation and accounting database can be found in annex I to this report.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by gas, base year[a] to 2012

			Gg CO_2 eq								*Change (%)*
		Greenhouse gas	*Base year*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year-2012*
Annex A sources		CO_2	90 092.25	80 231.65	58 043.08	53 707.77	45 416.81	47 721.37	53 197.35	48 363.95	–46.3
		CH_4	17 151.46	16 554.78	10 857.27	7 674.96	7 308.10	7 317.58	7 574.96	7 185.37	–58.1
		N_2O	15 354.41	13 033.78	7 089.24	5 298.57	4 829.46	5 042.68	5 010.32	5 241.35	–65.9
		HFCs	2.39	NA, NO	2.39	321.32	349.72	372.20	410.04	456.41	19 011.4
		PFCs	IE, NA, NO	NA, NO	IE, NA, NO	IE, NA, NO	0.02	0.04	0.05	0.04	NA
		SF_6	5.13	3.87	5.13	9.60	9.97	13.07	14.87	11.96	133.1
KP-LULUCF	Article 3.3[b]	CO_2				–376.78	–614.47	–695.02	–883.33	–994.67	
		CH_4				0.05	0.02	0.06	0.07	0.12	
		N_2O				0.01	0.004	0.01	0.02	0.03	
	Article 3.4[c]	CO_2	NA			NA	NA	NA	NA	NA	NA
		CH_4	NA			NA	NA	NA	NA	NA	NA
		N_2O	NA			NA	NA	NA	NA	NA	NA

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] The base year for Annex A sources refers to the base year under the Kyoto Protocol, which is 1988 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2012

			Gg CO_2 eq							*Change (%)*
	Sector	*Base year*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources	Energy	83 091.51	75 540.39	53 040.63	50 631.36	44 562.89	46 699.16	52 163.00	47 169.68	–43.2
	Industrial processes	11 964.01	8 846.52	9 421.59	5 978.73	3 219.43	3 574.41	3 992.23	3 895.22	–67.4
	Solvent and other product use	899.78	897.74	95.60	50.95	47.66	45.69	41.21	40.99	–95.4
	Agriculture	20 520.62	18 458.39	8 349.81	6 293.51	6 114.10	6 320.58	6 303.75	6 538.54	–68.1
	Waste	6 129.73	6 081.05	5 089.47	4 057.65	3 969.99	3 827.11	3 707.41	3 614.65	–41.0
	LULUCF	NA	–13 507.82	–12 569.69	–8 127.26	–8 460.69	–8 268.87	–8 394.15	–8 207.49	NA
	Total (with LULUCF)	**NA**	**96 316.26**	**63 427.42**	**58 884.96**	**49 453.39**	**52 198.07**	**57 813.45**	**53 051.60**	**NA**
	Total (without LULUCF)	**122 605.65**	**109 824.08**	**75 997.11**	**67 012.21**	**57 914.07**	**60 466.94**	**66 207.60**	**61 259.08**	**–50.0**
	Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c] Afforestation and reforestation				–598.85	–679.13	–812.38	–955.62	–1 093.43	
	Article 3.3[c] Deforestation				222.14	64.68	117.44	72.36	98.91	
	Total (3.3)				**–376.71**	**–614.45**	**–694.94**	**–883.25**	**–994.52**	
	Article 3.4[d] Forest management				NA	NA	NA	NA	NA	
	Article 3.4[d] Cropland management	NA			NA	NA	NA	NA	NA	NA
	Article 3.4[d] Grazing land management	NA			NA	NA	NA	NA	NA	NA
	Article 3.4[d] Revegetation	NA			NA	NA	NA	NA	NA	NA
	Total (3.4)	**NA**			**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] The base year for Annex A sources is the base year under the Kyoto Protocol, which is 1988 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

7. The 2014 annual submission was submitted on 15 April 2014; it contains a complete set of common reporting format (CRF) tables for the period 1988–2012 and an NIR. Bulgaria also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2014. The annual submission was submitted in accordance with decision 15/CMP.1.

8. Bulgaria submitted revised emission estimates on 4 November 2014 in response to the list of potential problems and further questions raised by the ERT. Bulgaria also submitted revised estimates on 4 November 2014 for KP-LULUCF in response to the list of potential problems and further questions raised by the ERT. The values used in this report are those submitted by Bulgaria on 4 November 2014.

9. The list of other materials used during the review is provided in annex II to this report.

2. Questions of implementation raised in the 2013 annual review report

10. The ERT noted that no questions of implementation have been raised in the 2013 annual review report.

3. Overall assessment of the inventory

11. Table 3 contains the ERT's overall assessment of the annual submission of Bulgaria. For recommendations for improvements for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

Issue	*Expert review team assessment*	*General findings and recommendations*
The ERT's findings on completeness		
Annex A sources[a]	Complete	Mandatory: none
		Non-mandatory: none
Land use, land-use change and forestry[a]	Complete	Mandatory: none
		Non-mandatory: carbon stock change in all pools in wetlands remaining wetlands and settlements remaining settlements, and net CO_2 emissions/removals from harvested wood products
		The ERT encourages Bulgaria to estimate and

Issue	*Expert review team assessment*	*General findings and recommendations*
		report emissions from all non-mandatory categories
KP-LULUCF	Complete	
The ERT's findings on recalculations and time-series consistency		
Transparency of recalculations	Sufficiently transparent, except in the agriculture sector	Please see paragraphs 49, 57, 72 and 79 below for category-specific findings
Time-series consistency	Sufficiently consistent	Please see paragraphs 37, and 82 below for category-specific findings
The ERT's findings on QA/QC procedures	Sufficient	Bulgaria has elaborated a QA/QC plan and has implemented tier 1 QA/QC procedures in accordance with that plan Please see paragraphs 13, 14, 35, 52, 62, 72, 78, 82 and 93 below for category-specific recommendations
The ERT's findings on transparency	Sufficiently transparent, except in the industrial processes sector	Please see paragraphs 16, 27, 34, 36, 38, 39, 40, 44, 46, 53, 56, 57, 62, 66, 74, 75, 80, 83 and 90 below for category-specific recommendations

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, ERT = expert review team, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

4. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

12. The NIR and additional information provided by Bulgaria during the review described the national system for the preparation of the inventory. As indicated by the Party in its NIR, there were no changes to the inventory planning process. The description of the inventory planning process, as contained in the report of the individual review of the annual submission of Bulgaria submitted in 2013,[3] remains relevant.

13. As noted in the previous review report, branch business associations and large industrial plants are part of the institutional arrangements for the national system, the latter through data collected for the energy sector under the European Union Emissions Trading System (EU ETS). In response to a question raised by the ERT during the review, Bulgaria clarified the uses and QA/QC of this information. Specifically, these data are used for both

[3] FCCC/ARR/2013/BGR, paragraphs 10–12.

validation of country-specific emission factors (EFs) and explaining process information (e.g. for cement production: calcium oxide content in the clinker, fraction of non-recycled calcined cement kiln dust and the use of non-carbonate sources). The ERT recommends that Bulgaria fully document the use and QA/QC of the data from branch business associations and the EU ETS in the NIR.

14. Bulgaria provided the ERT with a copy of its QA/QC plan. The ERT noted that this plan does not cover archiving and category-specific QA/QC procedures. However, in the Bulgarian national system, documentation and archiving are covered under the Council of Ministers regulation 215/21.09.2010 SG 76/2010 on the organization of the national inventories of hazardous substances and GHGs in the ambient air" while category-specific QA/QC procedures (tier 2) are described, for selected categories, in the NIR. The ERT recommends that Bulgaria include general QA/QC and sector-specific QA/QC activities in the QA/QC plan by referencing the appropriate documents.

Inventory preparation

15. Table 4 contains the ERT's assessment of Bulgaria's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Bulgaria

Issue	*ERT assessment*	*ERT findings and recommendations*
Key category analysis		
Was the key category analysis performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	Level and trend analysis performed, including and excluding LULUCF
Approach followed?	Both tier 1 and tier 2	
Were additional key categories identified using a qualitative approach?	No	
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	
Assessment of uncertainty analysis		
Approach followed?	Both tier 1 and tier 2	
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	See paragraph 16 below

Issue	*ERT assessment*	*ERT findings and recommendations*
Quantitative uncertainty (including LULUCF)	Level = 36.6% Trend = 8.6%	
Quantitative uncertainty (excluding LULUCF)	Level = 15.8% Trend = 2.8%	

Abbreviations: ERT = expert review team, IPCC good practice guidance = the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, LULUCF = land use, land-use change and forestry.

16. During the review, the ERT asked a number of questions about the uncertainty analysis and concluded that although the methods used were correct, in some places of the NIR they were incorrectly or ambiguously described (e.g. some headings, table 273 and the footnote to table 272). The ERT recommends that the Party clearly describe in the NIR the methods and assumptions used for the uncertainty analysis.

Inventory management

17. There were no changes to the inventory management process carried out by Bulgaria for the 2014 annual submission, as indicated by the Party in its NIR and in response to questions raised by the ERT during the review. The description of the inventory management process, as contained in the report of the individual review of the annual submission of Bulgaria submitted in 2013,[4] remains relevant.

5. Follow-up to previous reviews

18. The ERT acknowledges that many recommendations made in the 2013 review report have been addressed by Bulgaria in its 2014 annual submission, enhancing the transparency of the inventory across all sectors. Consequently, Bulgaria has improved its reporting for: the category consumption of halocarbons and SF_6; the LULUCF sector with regard to the representation of land area, the reference stocks of organic carbon in mineral soils and the method used to estimate the biomass loss associated with conversion from forest land to other land use; and the wastewater handling and waste incineration categories. In addition, under non-energy use of natural gas in petrochemical industries Bulgaria has adopted a country-specific fraction of carbon stored. The ERT welcomes these improvements.

19. Implementation of the compliance action plan[5] for Bulgaria continued in 2014. Bulgaria provided information about the status of the implementation of the compliance action plan in its NIR. In 2014, activities focused on internal training, improving cooperation with data providers and improving some sectoral estimates, such as halocarbons.

20. Recommendations from previous reviews that have not yet been implemented, as well as issues the ERT identified during the 2014 annual review, are discussed in the relevant sectoral chapters of the report and in table 9 below.

[4] FCCC/ARR/2013/BGR, paragraph 15.
[5] CC-2010-1-17/Bulgaria/EB.

B. Energy

1. Sector overview

21. The energy sector is the main sector in the GHG inventory of the Bulgaria. In 2012, emissions from the energy sector amounted to 47,169.68 Gg CO_2 eq, or 77.0 per cent of total GHG emissions. Since 1988, emissions have decreased by 43.2 per cent. The key drivers for the fall in emissions are the structural economic changes owing to the transition from a centrally planned economy to a market-based economy, which led to a decrease in demand for thermal power generation and energy-intensive products, and the introduction of energy efficiency measures in the residential sector. Within the sector, 66.9 per cent of the emissions were from energy industries, followed by 17.9 per cent from transport, 7.1 per cent from manufacturing industries and construction and 4.8 per cent from other sectors. Fugitive emissions from solid fuels accounted for 2.0 per cent and fugitive emissions from oil and natural gas accounted for 1.4 per cent. Emissions from other (fuel combustion) were reported as "IE" (included elsewhere) and "NO" (not occurring).

22. Bulgaria has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made by Bulgaria between the 2013 and 2014 annual submissions were in the following categories: manufacturing industries and construction; and fugitive emissions from solid fuels. The recalculations were made following changes in the activity data (AD) relating to non-energy use of fuels, the rectification of identified errors of double counting relating to CH_4 and N_2O emissions from alternative fuels and the inclusion of fugitive emissions from charcoal production as a new source of emissions. Compared with the 2013 annual submission, the recalculations decreased emissions in the energy sector by 40.74 Gg CO_2 eq (0.1 per cent) and decreased total national emissions by 0.1 per cent. The recalculations were adequately explained.

2. Reference and sectoral approaches

23. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 24–26 below.

Table 5
Review of reference and sectoral approaches

Issue	*Expert review team assessment*	*Paragraph cross-references*
Difference between the reference approach and the sectoral approach	Energy consumption: 13.59 PJ, 2.61% CO_2 emissions: 1 265.15 Gg CO_2, 2.81%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	Yes	See paragraph 24 below
Are differences with international statistics adequately explained?	Yes	
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Yes	

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

24. The difference between the two approaches is 2.8 per cent. Bulgaria provided detailed information in section 3.3.1.3 of its NIR explaining the difference. As the difference is more than 2 per cent, the ERT recommends that Bulgaria also provide a brief explanation of the cause of this difference in the documentation box of CRF table 1.A(c).

International bunker fuels

25. No problems were identified.

Feedstocks and non-energy use of fuels

26. In response to a recommendation made in the previous review report, Bulgaria adopted 1 as the fraction of carbon stored in the non-energy use of natural gas in petrochemical industries rather than using a default value from the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). Doing so led to significant differences between the calculations for the sectoral approach and the reference approach. The ERT commends Bulgaria for making this improvement, which resulted in more accurate emission estimates.

3. Key categories

Stationary combustion: liquid, solid – CO_2, CH_4 and N_2O[6]

27. Bulgaria reported CO_2, CH_4 and N_2O emissions from liquid and solid fuel use for iron and steel production as "NO" for the years after 2008. In responding to a question raised by the ERT during the review, Bulgaria clarified that the only basic oxygen furnace (BOF) steel-making plant that produces sinter, pig iron and steel was closed in 2008 and currently Bulgaria uses only electric arc furnaces to produce steel. Some small quantities of petroleum coke, which were previously reported under this category, were reallocated to feedstocks and non-energy use of fuels in accordance with the latest version of the International Energy Agency (IEA)/Eurostat questionnaire. The ERT recommends that Bulgaria include this explanation in the NIR to improve the transparency of the emission estimates for iron and steel production.

Road transportation: liquid fuels – CO_2

28. Bulgaria noted in its NIR that leaded gasoline has not been used in the country since 2004 and that default values of unleaded gasoline were applied for the emission estimates because country-specific data on hydrogen/carbon and oxygen/carbon ratios of leaded and unleaded gasoline could not be obtained. However, the CO_2 implied emission factors (IEFs) were not constant but showed a declining trend from 2006 onwards. Furthermore, the IEFs for recent years (70.78–70.62 kg/TJ, 2006 onwards) were lower than the default value of unleaded gasoline (70.94 kg/TJ). In response to questions raised by the ERT during the review, Bulgaria clarified that the European Monitoring and Evaluation Programme (EMEP) of the European Environment Agency (EEA) EFs (higher than the default IPCC factors) were adopted for the estimation of emissions to keep the estimates conservative and to exclude the impacts from biofuel blends, as biogasoline consumption commenced in the country, in insignificant amounts, only after 2013. Bulgaria also explained that the IEFs

[6] CH_4 and N_2O emissions from this category are not key. However, since all issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

were the output of the COPERT 4 model[7] and had concluded the main reason for them being lower was the evolution of the vehicle fleet. The ERT recommends that Bulgaria conduct a tier 2 estimate of CO_2 emissions from gasoline based on country-specific EFs (CO_2 emissions resulting from the COPERT model may serve to cross-check the tier 2 estimates).

29. The CO_2 IEF for liquefied petroleum gas in 2004–2006 (57.87 t/TJ) is 12 per cent below the overall trend (65.73 t/TJ) reported in 1997–2003 and 2007–2012 without any explanation provided in the NIR. In response to a question raised by the ERT during the review, Bulgaria explained that this finding results from the adoption of a higher net calorific value (NCV) (52.25 TJ/Gg) for 2004–2006 compared with the lower NCV (46.00TJ/Gg) for other years since 1997 in order to harmonize Bulgaria's national statistics (based on NCV information from producers/importers) with the IEA/Eurostat data (average NCV for liquid fuels). Although these fluctuations have no impact on CO_2 emission estimates, because the COPERT model adjusts the annual mileage in order to achieve an exact match with the reported fuel consumption in physical units (Gg), the ERT encourages Bulgaria to include these explanations in the NIR of its next annual submission to improve transparency.

Coal mining and handling: solid fuels – CO_2 and CH_4

30. Bulgaria applied a tier 1 method for the estimation of CH_4 emissions from underground coal mining and handling, which was identified as a key category. This issue was also raised during the previous review. In response to a question raised by the ERT during the review, Bulgaria stated that it is planning to estimate the financial costs related to development of a country-specific EF. Noting that most of the coal produced in Bulgaria is lignite, which has a lower EF than other coal products such as bitumen, the ERT considers that using a tier 1 method in this situation is conservative and does not lead to an underestimation of emissions. The ERT recommends that Bulgaria develop a country-specific EF for fugitive CH_4 emissions from underground coal mining and handling to enable the Party to apply a higher-tier method to this category.

4. Non-key categories

Civil aviation: liquid fuels – CO_2, CH_4 and N_2O

31. Bulgaria reported CO_2, CH_4 and N_2O emissions from gasoline as "NO" for 1991, 2000, 2006 and 2007. In response to a question raised by the ERT during the review, Bulgaria explained that the consumption of aviation gasoline is usually about 0.5 Gg per year and could be rounded down to zero when the consumption is below 0.5 Gg. The ERT noted that the use of the notation key "NO" in this case is not appropriate and recommends that Bulgaria apply the appropriate definitions for the notation keys when reporting emissions in the CRF tables.

C. Industrial processes and solvent and other product use

1. Sector overview

32. In 2012, emissions from the industrial processes sector amounted to 3,895.22 Gg CO_2 eq, or 6.4 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 40.99 Gg CO_2 eq, or 0.1 per cent of total GHG emissions. Since the base year, emissions have decreased by 67.4 per cent in the industrial processes sector, and decreased by 95.4 per cent in the solvent and other product use sector. The key

[7] See <http://www.emisia.com/copert/>.

driver for the fall in emissions in the industrial processes sector in all categories (except for consumption of halocarbons and SF_6) is the economic crises of 1989–1990, 1997–1998 and 2009. During 2012 there was a slight decrease in emissions of 2.4 per cent mainly owing to the introduction of more efficient technologies at the plant level together with market shrinkage and a reduction in maintenance time (e.g. a 28 per cent decrease in the total emissions from ammonia production). Within the industrial processes sector, 73.3 per cent of the emissions were from mineral products, followed by 13.4 per cent from the chemical industry and 12.0 per cent from the consumption of halocarbons and SF_6. The remaining 1.3 per cent was from metal production.

33. Bulgaria has made recalculations between the 2013 and 2014 annual submissions for the industrial processes sector. The most significant recalculation made by Bulgaria between the 2013 and 2014 annual submissions was in consumption of halocarbons and SF_6. The recalculation was made in response to recommendations made in the 2013 annual review report, following changes in AD and the use of improved methodologies. Compared with the 2013 annual submission, the recalculation increased emissions in the industrial processes sector by 14.3 Gg CO_2 eq (0.4 per cent). The ERT commends the Party for the improvements to its reporting, and encourages Bulgaria to continue revising AD and conducting all necessary recalculations. The recalculations were adequately explained.

34. Bulgaria has not included in its NIR fully transparent descriptions of: methods (e.g. equations for fluorinated gases (F-gases)); emission calculations; and country-specific parameters used (e.g. cement, lime and ferroalloy types). Moreover, Bulgaria has omitted chapters for specific categories (e.g. CH_4 emissions from ethylene, dichloroethylene, styrene and methanol production). In response to questions raised by the ERT during the review, Bulgaria provided a spreadsheet including confidential data for the above-mentioned categories. The ERT reiterates the recommendation made in the previous review report that Bulgaria revise the chapter in the NIR on industrial processes and include additional background information for these categories, aggregating information to protect confidential information as necessary, to increase the transparency of the emission estimates.

35. Bulgaria has made efforts to improve consistency between the CRF tables and the NIR. However, the ERT noticed some inconsistencies remain (e.g. the IEF and AD for coke production for 1988–2008 are reported in NIR table 125 but mentioned as "confidential" in the CRF tables). In addition, the ERT noted an incorrect use of notation keys (e.g. CO_2 emissions from coke production are reported as "NO" in the CRF tables where they should have been reported as "IE"). The ERT reiterates the recommendation made in the previous review report that Bulgaria strengthen its QC activities to ensure that information included in the NIR is consistent with the data reported in the CRF tables and review, and as appropriate revise, the use of notation keys in the industrial processes sector.

2. Key categories

Lime production – CO_2

36. Bulgaria reported that country-specific data on total lime production (quicklime), which are provided by the National Statistical Institute (NSI), have been used to estimate the emissions of CO_2 from lime production. The ERT noted that there is no disaggregation of reported data under this category per lime type (i.e. quicklime and dolomitic lime), and also noted that the method used to calculate the ratio between the quicklime and dolomitic lime for the period 1998–2008 is not clear. In response to a question raised by the ERT during the review, Bulgaria provided a spreadsheet showing data for quicklime and dolomite lime production and estimated emissions as provided by NSI. Moreover, the spreadsheet provided includes the ratio of quicklime to dolomite lime, and explains that the ratio for the latter quantity to the total for the period 1988–1997 is estimated and applied for the period 1998–2008. The ERT reiterates the recommendation made in the previous

review report that Bulgaria provide in the NIR the method and source used for estimating the ratio between quicklime and dolomitic lime production.

Other (mineral products) – CO_2

37. The ERT noted that, for ceramic production, Bulgaria used EU ETS production data for 2008 to obtain a country-specific EF of 0.10 kt CO_2/kt of ceramics produced. This EF was used for the period 1988–2008 but adjusted EFs, namely 0.07, 0.06, 0.05 and 0.06 kt CO_2/kt ceramics produced, were used for the years 2009, 2010, 2011 and 2012, respectively. In response to a question raised by the ERT during the review, Bulgaria explained that emissions from this category were not reported until 2008. The IEF from the reports of the plant operators was defined for the first time in 2010, and it was used for the entire period. Moreover, Bulgaria mentioned that in their initial reports, the plant operators used default EFs because of a lack of information and the necessity to estimate carbonates in clay. In the years after 2010, larger producers used analyses of the clay where the quantity of limestone is measured and therefore the EFs for those years are different. The ERT reiterates the recommendation made in the previous review report that Bulgaria assess whether the accuracy of the adjusted IEFs based on the newly available data from the EU ETS applied for the period 2009–2012 would be more accurate than the EFs applied prior to 2008 and, if appropriate, conduct the necessary recalculations based on the applied EFs for the period 1988–2007.

Ammonia production – CO_2

38. Bulgaria reported in its NIR that CO_2 emissions from ammonia production decreased by 28.0 per cent between 2011 (526.1 Gg CO_2 eq) and 2012 (377.9 Gg CO_2 eq). In response to a question raised by the ERT during the review, Bulgaria informed the ERT that because of ongoing activities relating to the optimization of the ammonia production process and market shrinkage, there was a decrease in production and consequently a reduction in CO_2 emissions. The ERT accepted the explanation provided by the Party but noted that the AD of ammonia production (kt/year) and EF (kt CO_2/kt NH_3) are reported by Bulgaria as confidential, and therefore the underlying reasons for the reported decline in emissions from this category are not transparent in the NIR and cannot be verified. The ERT recommends that Bulgaria report more information to justify the decrease in emissions from ammonia production and include in the NIR the explanation provided to the ERT during the review.

39. Bulgaria uses an equation from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) for the estimation of CO_2 emissions from ammonia production. The equation includes the deduction of CO_2 recovered for urea production from total CO_2 emissions of ammonia production. The ERT noted that subtracting CO_2 emission for urea production may lead to an underestimation of total emissions for situations where the deducted emission are not reported elsewhere in the inventory, because this carbon is stored for only a short time. In response to questions raised by the ERT during the review, Bulgaria stated that the recovered emissions from carbide/urea are not estimated yet and are not deducted from the CO_2 emissions from ammonia production, and that the recovered carbon is considered to be zero. The ERT determined that the current method is consistent with good practice guidance but reiterates the recommendation made in the previous review report that Bulgaria clearly explain in its NIR the source of the equation used for the CO_2 emission estimate and recommends that the Party clearly report how emissions of CO_2 recovered for use in urea production are accounted for in the inventory.

Iron and steel production – CO_2

40. The ERT commends Bulgaria for improving the reporting of this category by providing additional information on the category description of open hearth furnaces (used

until 1993), and the methodologies used for the calculation of the country-specific EF, in accordance with recommendations made in the previous review report. The ERT recommends that Bulgaria continue to report more information under this category in the next annual submission.

41. The ERT noted that there is a discrepancy between the NIR and CRF table 2(I).A-G regarding the use of the notation key "NO" for CO_2 emissions from pig iron and coke production. The ERT considers that this notation key is not correct because, to avoid double counting, Bulgaria reported CO_2 emissions from pig iron production under steel production (in the industrial processes sector) and reported coke production under manufacture of solid fuels and other energy industries (in the energy sector), so the correct notation key is "IE". In response to a question raised by the ERT during the review, Bulgaria clarified that production using a BOF is a continuous process going through many intermediate stages, one of which is the production of liquid pig iron as an intermediate product, and the notation key "NO" is used because the BOF steel production is considered to be a single process. The ERT considers that even if pig iron production is an intermediate process, emissions are occurring and, because they are included in another category, they should be labelled as "IE". The ERT therefore reiterates the recommendation made in the previous review report that Bulgaria use the notation key "IE" for pig iron production and coke production.

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6

42. In response to a recommendation made in the previous review report, Bulgaria has improved its reporting under this category (e.g. method of calculating HFC emissions from refrigeration and air-conditioning system disposal, emission estimate reporting under electric equipment). In response to a question raised by the ERT during the review, Bulgaria stated that it has made changes to the AD because emissions had previously been reported from some activities that do not occur in the country (e.g. production of refrigeration equipment for trucks) and some models were improved (e.g. number of vehicles with equipment using F-gases and the amount of F-gases in this equipment). In addition, Bulgaria mentioned that, before the recalculations, the value for the number of vehicles was a fraction while at present the value is an integer. The effects of the recalculations vary, but in most cases there is a slight increase in the emissions from these categories. The ERT commends Bulgaria for the improvements made to the reporting of this category and encourages the Party to continue improving and adjusting AD according to recent statistics.

43. In response to a recommendation made in the previous review report, Bulgaria separated the reported data from the railways into refrigeration and air-conditioning equipment (all were previously reported as refrigeration). The emissions relating to imported carriages for passenger transport are included in this category. To estimate the emissions from this category, Bulgaria uses an EF of 15 per cent. Production of air-conditioning equipment for railway carriages started in 2011 and all of it is exported. The data are acquired from the manufacturer's report, which also says that the cooling agents used are HFC-134a and R-407C, and an EF of 0.35 per cent is used for emission estimation from this category. The ERT commends Bulgaria for this effort and encourages the Party to continue collecting more accurate data for this category.

44. Bulgaria reported in its 2012 and 2013 NIR emissions of HFC-134a and HFC-152a from the use of these gases in foam manufacturing for the period 2005–2012. However, there are no explanations of the methodology, parameters and assumptions used for the calculation of these emissions, because the input data are reported as "confidential". In response to a question raised by the ERT during the review, Bulgaria provided a spreadsheet including more detailed information on AD, global warming potentials and emission estimates collected by the Regional Inspectorates of Environment and Waters

(RIEW) based on the European Union regulation on F-gases. Bulgaria also stated that, at present, there is only one foam manufacturer using HFC-134a and HFC-152a as foaming agents, where production started in 2005 and approximately 50 per cent of the production is exported. The ERT reiterates the recommendation from the 2013 review report that Bulgaria improve transparency by providing more information about the methodology, parameters and assumptions used for emission estimates under this category in its next submission.

3. Non-key categories

Carbide production – CO_2

45. Bulgaria uses anthracite as a reducing agent in carbide production, and applies an EF of 1.09 t CO_2/t carbide to estimate CO_2 emissions, following a tier 1 method from the Revised 1996 IPCC Guidelines. The Party reported that there was a decrease in calcium carbide production in 2012, which led to a decrease in emissions by approximately 16.0 per cent. Bulgaria stated in its NIR that further investigations will be conducted on the quantity of the anthracite used as a reducing agent to ensure that there is no double counting with the energy sector. In response to a question raised by the ERT during the review, Bulgaria explained that the quantities of coal used for carbide are not subtracted from the energy sector because they are not available, and the estimation of CO_2 emissions is conducted using a tier 1 method because this is not a key category. The ERT reiterates the recommendation made in the previous review report that Bulgaria investigate the quantity of anthracite used as a reducing agent and deduct these emissions from the energy sector.

Other (chemical industry) – CH_4

46. Bulgaria reported CH_4 emissions from this category for ethylene, dichloroethylene, styrene and methanol production for the period 1988–2009 without explaining the methods and data sources used, and emissions have been reported as "NO" for the period 2010–2012. In response to a question raised by the ERT during the review, Bulgaria provided a spreadsheet including data by NSI and confirmed that the tier 1 methodology and default EFs are used and that the plant ceased production in 2009. The ERT reiterates the recommendation made in the previous review report that Bulgaria include information in the NIR for this category on AD sources, EFs and associated parameters, methods and assumptions to ensure that all estimates can be independently verified.

Ferroalloy production – CO_2

47. Bulgaria reported CO_2 emission under this category as "confidential". In response to a question raised by the ERT during the review, Bulgaria provided a spreadsheet containing confidential data from NSI on ferroalloy production, disaggregated by ferroalloy type, and confirmed that emissions were estimated based on the tier 1 approach using a default EF (2.4 t CO_2/t ferroalloy) for the total ferroalloy production volume. Considering the information provided, and the availability of data by ferroalloy type, the ERT recommends that Bulgaria improve the accuracy of its reporting by recalculating emissions for this category by applying default EFs based on ferroalloy type and using available AD.

D. Agriculture

1. Sector overview

48. In 2012, emissions from the agriculture sector amounted to 6,538.54 Gg CO_2 eq, or 10.7 per cent of total GHG emissions. Since 1988, emissions have decreased by 68.1 per cent. The key drivers for the fall in emissions are a decrease in key livestock populations and crop production. Within the sector, 61.8 per cent of the emissions were from

agricultural soils, followed by 19.5 per cent from enteric fermentation. Manure management accounted for 17.0 per cent and rice cultivation accounted for 1.3 per cent. The remaining 0.5 per cent was from the field burning of agricultural residues. Emissions from prescribed burning of savannahs and other (agriculture) were reported as "NA" (not applicable).

49. Bulgaria has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made by Bulgaria between the 2013 and 2014 annual submissions were in the following categories: CH_4 emissions from manure management for pigs; and N_2O emissions from agricultural soils. The ERT notes that the NIR states "the recalculation is due to newly determined emission factors", "change in animal weights due to recommendation for young cattle from the technical review of GHG inventories under the EU effort sharing decision in 2012" and "change in animal waste management system (AWMS) distribution and nitrogen excretion rates (Nex) for poultry"; however, the recalculation was performed only for swine. The recalculation of CH_4 was made following changes in the excretion rate of volatile solids (VS), and the recalculation of N_2O emissions from soils was made using the updated values for sewage sludge applied to agricultural fields. Compared with the 2013 annual submission, the recalculations decreased the emissions in the agriculture sector by 155.25 Gg CO_2 eq (2.5 per cent) and decreased total national emissions by 0.2 per cent. The recalculations were not sufficiently explained in the NIR. The ERT reiterates the recommendation made in the previous review report that Bulgaria include all relevant information regarding recalculations in the NIR.

50. Bulgaria submitted revised estimates in response to the list of potential problems and further questions raised by the ERT regarding the underestimation of Nex from several animal categories (see paras. 56, 58 and 59 below). The recalculations had an impact on the N_2O emissions from manure management and agricultural soils, and on indirect emissions from atmospheric deposition and leaching. The revised estimates increased the total GHG emissions in 2012 from the agriculture sector by 213.46 Gg CO_2 eq (3.4 per cent).

51. The agriculture sector is complete in terms of categories, gases and estimates. However, the ERT encourages Bulgaria to improve the transparency and accuracy in the agriculture sector, including by providing more agricultural information in the NIR (e.g. the AWMS variation in the period 1990–2012 provided in NIR table 176 shows that 90 per cent of manure is treated in anaerobic lagoons for swine, decreasing to 27 per cent in 2000 and increasing again, to 83 per cent, in 2011).

52. In response to recommendations made in the previous review report, Bulgaria solved most of the inconsistencies within the NIR and between the NIR and the CRF tables. However, several new inconsistencies emerged (e.g. NIR table 176 has not been updated, NIR tables 165–167 and 176 have incorrect cross-references, the uncertainty estimates in section 6.4.3 and table 172 of the NIR are different). The ERT recommends that Bulgaria improve its QA/QC procedures in the agriculture sector.

2. Key categories

Enteric fermentation – CH_4

53. Bulgaria uses a tier 2 method to estimate CH_4 emissions from enteric fermentation. In the 2013 annual submission, the Party performed recalculations in this category to account for changes in AD, such as animal weight. However, the previous review report states that the recalculations were not sufficiently described in the NIR and recommended that Bulgaria include more detailed information on AD and the emission calculation process in the 2014 annual submission. The current ERT noted that no additional information has been provided by Bulgaria in the NIR of the current annual submission. The ERT therefore reiterates the recommendation made in the previous review report that Bulgaria provide in the NIR detailed information on the AD used and the emission calculation method applied for this category, especially for young cattle.

Manure management – CH_4 and N_2O

54. In Bulgaria, most of the manure from swine (83.6 per cent) is treated in anaerobic lagoons. This situation is unique to Bulgaria, considering that the use of anaerobic lagoons in other European countries is only a small fraction of the total AWMS. The value of the methane conversion factor (MCF) selected for estimating CH_4 emissions in anaerobic lagoons is 90 per cent (based on the Revised 1996 IPCC Guidelines for temperate climate, as selected by Bulgaria). The ERT considers that using an MCF value of 90 per cent could lead to an overestimation of CH_4 emissions considering that swine are a significant source of CH_4 emissions from manure, the majority of farm units are smallholdings, and all animals are classified to live in cool climate where decomposition of organic matter is slow (as indicated in CRF table 4.B(a)). The ERT reiterates the recommendation made in the previous review report that Bulgaria justify the use of an MCF of 90 per cent, and make efforts to develop a country-specific value.

55. Bulgaria used country-specific data on manure production and nitrogen (N) content of swine and cattle in the 2014 annual submission. However, Bulgaria has explained neither how and when the manure production is measured, nor the uncertainty level associated with these values. Despite the strong recommendation made in the previous review report, Bulgaria has not provided additional details in the NIR on the process for obtaining these values. During the review, the ERT requested further information on protein intake in cattle feed and swine feed. In response to this request, Bulgaria provided detailed information on daily protein intake by cattle and average protein content in swine feed. Based on the information received and considering the general equations in the Revised 1996 IPCC Guidelines and IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance), the ERT considered that there could be a possible underestimation of N_2O emissions from manure management systems because of an underestimation of the Nex, and included this issue in the list of potential problems and further questions raised by the ERT.

56. In response to the list of potential problems and further questions raised by the ERT, Bulgaria resubmitted a complete set of CRF tables for 1988–2012 with updated Nex values and recalculations of N_2O emission estimates from manure management systems. The updated values are based on Nex rates of 99.9 for mature dairy cattle, 116.1 for mature non-dairy cattle, 39.5 for young cattle and 11.9 for breeding swine. The revised Nex values increased the N_2O emissions from manure management systems in 2012 from 1.70 to 1.92 Gg N_2O, which is equivalent to an increase of 12.7 per cent. The ERT accepted the revised estimates considering that the revised Nex values are in line with the scientific literature. The ERT recommends that Bulgaria investigate the Nex values further and provide additional transparent documentation that the values are appropriate estimates for conditions in Bulgaria in its next annual submission.

57. In the previous review report there was a recommendation that Bulgaria generate appropriate country-specific values on VS from swine and poultry. In the 2013 annual submission, Bulgaria had provided information about its efforts in reviewing the literature for more appropriate data. In the 2014 annual submission, Bulgaria has revised its estimate for VS from swine from the default IPCC value of 0.5 kg dry matter/head/day to 0.45 kg dry matter/head/day. However, no information was provided in the NIR on the background relating to this revision. The average amount of VS reported among all Parties included in Annex I to the Convention in 2012 is 0.386 kg dry matter/head/day. The ERT concludes that the recalculation has therefore not led to an unrealistically low value. The ERT welcomes the Party's use of country-specific values for VS and recommends that Bulgaria present in detail in the NIR the relevant and scientifically justified information regarding the country-specific value of VS for swine.

Direct soil emissions – N_2O

58. In response to the list of potential problems and further questions raised by the ERT (see para. 56 above), Bulgaria submitted revised estimates for Nex for the entire time series, resulting in an increase in N_2O emissions from animal manure applied to soil in 2012 from 0.91 Gg N_2O to 1.1 Gg N_2O and an increase in N_2O emissions from pasture, range and paddock in 2012 from 0.88 Gg N_2O to 0.95 Gg N_2O. The ERT accepts the revised emission estimates provided by Bulgaria based on the revised estimates for Nex.

Indirect soil emissions – N_2O

59. In response to the list of potential problems and further questions raised by the ERT (see para. 56 above), Bulgaria submitted revised estimates for Nex, and recalculated the indirect N_2O emissions from atmospheric deposition and from leaching and run-off in 2012, resulting in an increase from 4.44 Gg N_2O to 4.65 Gg N_2O. The recalculations have been performed for the entire time series and the ERT accepts the revised estimates provided by Bulgaria based on the revised estimates for Nex.

60. Bulgaria has estimated indirect N_2O emissions from atmospheric deposition and nitrogen (N) leaching and run-off using the IPCC tier 1a method and default IPCC EFs and parameters. As referenced in the previous two review reports, more detailed data on ammonia volatilization are available from Bulgaria's submission under the Convention on Long-range Transboundary Air Pollution of the United Nations Economic Commission for Europe (UNECE). In order to improve the accuracy of emission estimates from ammonia volatilization and the consistency of reporting between the UNFCCC and UNECE, the ERT reiterates the recommendations made in the previous review reports that Bulgaria use country-specific parameters to estimate N_2O emissions from ammonia volatilization and report them under the indirect soil emissions category.

3. Non-key categories

Rice cultivation – CH_4

61. The CH_4 IEF (40.00 g/m_2) for continuously flooded, irrigated rice cultivation is the highest of reporting Parties (ranging from 10 to 40 g/m^2 in 2012) and is higher than the IPCC default range of 12–28 g/m^2. This high EF is a result of the fact that Bulgaria applied a tier 1 method, using the standard EF (20 g/m^2) provided in table 4.22 of the IPCC good practice guidance multiplied by the scaling factor of 2 for organic amendment. Based on this tier 1 method, the use of the scaling factor for organic amendment implies that the organic application rate in Bulgaria is between 1.5 and 3.5 t/ha. For more accurate estimates, the ERT encourages Bulgaria to check whether this is consistent with the organic amendment practice in the country.

Field burning of agricultural residues – CH_4 and N_2O

62. The previous review report recommended that Bulgaria justify some of the parameters used in the estimates for field burning of agricultural residues. The ERT noted that none of the parameters mentioned in the 2013 review has been changed and the NIR stipulates that no recalculation has taken place, although the ERT noted that a small recalculation has taken place for potatoes. The ERT considers that it is very difficult to burn potato tops and this could be an error in reporting. The recalculation has increased the emissions from field burning of agricultural residues by 0.12 Gg CO_2 eq or 0.003 per cent of the total agricultural emissions. In addition, Bulgaria does not use the values from the IPCC good practice guidance for the carbon/nitrogen (C/N) ratio in plants for estimating emissions from field burning of agricultural residues. The C/N ratios used in CRF table 4.F are different from the values given in NIR table 180 (which are the default values from the IPCC good practice guidance); specifically, the C/N ratio of wheat is 0.012 in CRF table 4.F versus 0.006 in the IPCC good practice guidance, for barley it is 0.012 versus 0.009, for rice it is 0.16 versus 0.016 and for sunflowers it is 0.033 versus 0.017. The ERT

recommends that Bulgaria provide a justification for the values used in the CRF tables or use the values from the IPCC good practice guidance, and correct the inconsistency identified.

E. Land use, land-use change and forestry

1. Sector overview

63. In 2012, net removals from the LULUCF sector amounted to 8,207.49 Gg CO_2 eq. Since 1988, net removals have decreased by 40.5 per cent. The key driver for the fall in removals is the decline in the rate of forest growth as the average age of the forest stands steadily increases. Within the sector, 10,352.49 Gg CO_2 eq of net removals were from forest land, followed by 632.69 Gg CO_2 eq from grassland. Net emissions were reported from cropland (1,572.96 Gg CO_2 eq) and settlements (939.42 Gg CO_2 eq). The remaining 265.31 Gg CO_2 eq net emissions were from wetlands. Emissions from other land were reported as "NO" and emissions from other (LULUCF) were reported as "NE, NO".

64. Bulgaria has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made by Bulgaria between the 2013 and 2014 annual submissions were in the following categories: cropland and settlements. The recalculations were made in response to recommendations made in the 2013 annual review report. Compared with the 2013 annual submission, the recalculations increased removals in the LULUCF sector by 414.73 Gg CO_2 eq (5.2 per cent). The recalculations were adequately explained.

65. The ERT commends Bulgaria for the significant improvement since the 2013 annual submission, particularly with regard to the representation of land area, the reference stocks of organic carbon in mineral soils under different land-use categories and the method used for estimating the biomass loss associated with conversion from forest land to other land uses. The ERT encourages Bulgaria to continue implementing the improvement plan in its annual submission, particularly in areas of land-use classification and representation, and the method for estimating the emissions from dead wood associated with conversion from forest land to other land uses.

66. Bulgaria stated in the NIR that the national forest inventory and the forest management plans are carried out for each state forest enterprise and these are the main sources of information for the area of forest land and land-use changes. In response to a question raised by the ERT during the review concerning the information on private forests, Bulgaria explained that the share of private forests has increased in recent years. In 2013, the share of private forests was 11 per cent of the total forest area, and 94 per cent of these private forests are properties with an area up to 2 ha. According to the Law on Forests 2011, "forestry plans shall be developed for the forest territories that are state and municipal property, as well as for the private forest territories with land property above 50 hectares. For the private forests with total area up to 50 hectares a forestry programme shall be developed." The AD used for the accounting of the emissions/removals from the forest land category are provided by the Executive Forest Agency and cover both the state and the private forests. The ERT recommends that Bulgaria include this information in the NIR of its annual submission to enhance transparency.

2. Key categories

Forest land remaining forest land – CO_2

67. Bulgaria applied a tier 1 method for carbon stock change in dead organic matter and soil pools for this category, assuming that carbon stock changes in these pools are zero. As forest land remaining forest land is a key category, the ERT reiterates the recommendation

made in the previous review that Bulgaria apply a higher-tier method to estimate emissions and removals in the dead organic matter and soil carbon pools.

Land converted to forest land – CO_2

68. Bulgaria has reported carbon loss in living biomass in CRF table 5.A and stated in the NIR that the biomass of the previous land use, which is lost because of the land-use change to forest, is estimated as described in the related land-use chapters. However, it is unclear from the description of other land-use categories how the carbon loss in living biomass of the previous land use was estimated. In response to a question raised by the ERT during the review, Bulgaria provided a detailed description of the method and data used for calculating living biomass for cropland and grassland. The ERT recommends that Bulgaria include this information in the NIR.

69. Bulgaria assumed that the reference carbon stock in mineral soil for the category other land converted to forest land is zero for the estimates of carbon stock changes in mineral soil for other land converted to forest land. In response to a question raised by the ERT during the review concerning the rationale of the assumption, Bulgaria explained that the soil carbon in other land was assumed to be zero (0 t C/ha) because of the natural characteristics of the lands under this category – rocks and landslides. The ERT considers that if there are soils suitable for forest growth, the soil carbon stock is unlikely to be zero; if there was no soil, forests could not be present. The ERT considers that the zero assumption potentially overestimates the carbon stock changes in mineral soils for other land converted to forest land. The ERT therefore recommends that Bulgaria develop a country-specific value for the reference soil carbon stock in other land, and estimate the carbon stock changes in mineral soil for other land converted to forest land using the new value in its annual submission.

F. Waste

1. Sector overview

70. In 2012, emissions from the waste sector amounted to 3,614.65 Gg CO_2 eq, or 5.9 per cent of total GHG emissions. Since 1988, emissions have decreased by 41.0 per cent. The key drivers for the fall in emissions are the decrease in the amount of deposited waste as a result of improved waste management and decreased population, the introduction of CH_4 recovery in 2010 as well as decreased industrial output and thus decreased industrial wastewater emissions. Within the sector, 78.3 per cent of the emissions were from solid waste disposal on land, followed by 20.6 per cent from wastewater handling. Waste incineration accounted for 0.8 per cent. The remaining 0.4 per cent was from other (waste).

71. Bulgaria has made recalculations between the 2013 and 2014 annual submissions for this sector. The largest recalculation made by Bulgaria between the 2013 and 2014 annual submissions was in the category wastewater handling. The recalculation was made in response to the 2013 annual review report (consideration of CH_4 recovery from domestic wastewater) and following changes in AD (protein intake). Compared with the 2013 annual submission, the recalculations decreased emissions in the waste sector by 54.42 Gg CO_2 eq (1.4 per cent) and decreased total national emissions by 0.1 per cent. The recalculations were not adequately explained (see paras. 72 and 79 below).

72. The most significant recalculation – CH_4 emissions from wastewater handling – was not described in the 2014 annual submission, but was explained in response to questions raised by the ERT during the review (see para. 79 below). In addition, the revision of recycled household waste was described in the recalculation chapter of the category solid waste disposal, although this revision was not reflected in the landfilled waste statistics and thus did not affect emissions from that source. The ERT recommends that Bulgaria enhance

its QC activities in the waste sector and include more adequate information on the recalculations in the annual submission.

2. Key categories

Solid waste disposal on land – CH_4

73. Bulgaria applies the first-order decay method for calculating emissions from solid waste disposal on land, which is in line with the IPCC good practice guidance, and it uses data on generated waste from 1950–2012. The previous review report recommended that Bulgaria include data and parameters used for some years of this period prior to 1988 to increase transparency. The current ERT found some information on the generated waste and degradable organic carbon applied for this period in the NIR, but encourages Bulgaria to include this information in a concise form in its NIR (e.g. include some years (1950, 1960, 1970 and 1980) in table 226 "Parameters in tier 2 for solid waste disposal sites") to increase transparency.

74. Previous review reports recommended that Bulgaria include in its NIR information on industrial waste disposal. In response to a question raised by the ERT during the review, Bulgaria stated that all relevant wastes going to landfills are considered in the national statistics (delivered by NSI), which are based on questionnaires sent to municipalities and that paper and cardboard, wood waste and vegetable waste from industrial sources are also covered. Bulgaria explained that the current method for data collection does not allow for separate accounting of municipal and industrial waste, but NSI is currently developing a new methodology for data collection which will enable Bulgaria to report more transparently the amounts and types of industrial waste in the future. The ERT recommends that Bulgaria make further efforts to increase transparency by reporting on the industrial waste amounts and the types considered.

75. Bulgaria calculates the specific methane generation rate constant (k) for paper, garden, food and wood waste based on default half lives from the 2006 IPCC Guidelines and then derives a weighted k value. During the review, in response to a question raised by the ERT, Bulgaria informed the ERT about its plan to describe more clearly its approach of k calculation in the NIR. The ERT commends the Party for this plan and recommends that Bulgaria clarify what half-life values are used in the calculation.

76. Bulgaria considered CH_4 recovery for the years 2010–2012. In earlier years, Bulgaria reports "NO" for CH_4 recovery. In response to a recommendation made in the previous review report, Bulgaria provided information on the collection and conversion of CH_4 volumes in the NIR. The calculation of CH_4 from landfills is based on questionnaires sent to landfill operators containing questions on CH_4 stored in reservoirs and burned in a flare and on CH_4 utilization. The ERT commends Bulgaria for this improvement, and encourages the Party to include all available data on CH_4 recovered (2010–2012) in the NIR (e.g. in table 226) to further improve transparency.

Wastewater handling – CH_4

77. Bulgaria estimated CH_4 emissions from domestic and commercial wastewater using a tier 1 method and parameters from the Revised 1996 IPCC Guidelines (biological oxygen demand) and the IPCC good practice guidance (maximum methane-producing potential (B_0)). In response to a recommendation made in the previous review report, the Party has included a table on the different treatment systems. The ERT commends Bulgaria for providing this information in the NIR.

78. The ERT noted inconsistencies in the reporting on the categorization of the wastewater treatment system. In the NIR (page 411), "Category 2" is described as water discharged through sewer systems into centralized anaerobic wastewater treatment plants.

In NIR table 229, however, contradictory information is given as the relevant column is defined as centralized, aerobic, not well managed treatment plants. Inconsistencies were also detected in the reporting and use of the methane correction factor (MCF_i) value for anaerobic treatment of sludge: although reported as 0.8 in the NIR, an MCF_i value of 1 was used in the calculation, according to information provided to the ERT during the review and confirmation of the value by the Party in response to a question raised by the ERT. Furthermore, the ERT identified the need for improvements to transparency with regard to EFs and parameters applied by Bulgaria. In some cases, the sectoral NIR chapter includes tables from the 2006 IPCC Guidelines and the IPCC good practice guidance without clear information on exactly which values are used in the calculation (e.g. table 225 on default half-life values, table 231 on chemical oxygen demand (COD) for industrial types). The ERT recommends that Bulgaria improve the accuracy of its reporting and its QA/QC activities to avoid such inconsistencies in the future.

79. The previous ERT noted that in the 2013 NIR, CH_4 recovery from handling of domestic and commercial wastewater was reported as "NO" although information was apparently available (Bulgaria provided a spreadsheet containing data on CH_4 recovery during the previous review). The previous ERT recommended that the Party recalculate emissions accordingly and include the information in the NIR. In the 2014 annual submission, CH_4 recovery values were indeed reported and information on the source (country-specific data provided by operators of water supply and service utilities) was included in the NIR. The ERT commends Bulgaria for this improvement. However, the related recalculation of CH_4 recovery was neither described in the NIR under the respective source-specific recalculations nor reported in CRF table 8(a). In response to the questions raised by the ERT during the review the issue was clarified. The ERT recommends that Bulgaria provide more information on the recalculations performed to improve transparency in the future.

80. The ERT noted that Bulgaria uses the notation key "NO" in CRF table 6.B for CH_4 recovery from sludge handling. In response to a question raised by the ERT during the review, the Party explained that the notation key for CH_4 recovery from sludge is not correctly used and should be changed to "IE". The ERT recommends that Bulgaria correct the notation key accordingly and clearly indicate where the respective emissions are included.

81. The ERT noted that information on the different domestic sludge treatment practices (handling systems) is not provided in the NIR, although inclusion of this information was a recommendation in the previous review report. Moreover, information on the maximum methane-producing potential (B_0) used for estimating emissions from sludge treatment is also not included in the NIR. During the review the Party provided the ERT with a document containing this information. The ERT reiterates the recommendation made in the previous review report that the Party improve transparency and provide background information on domestic sludge treatment in the NIR.

82. In response to a question raised by the ERT during the review, Bulgaria provided a spreadsheet containing calculations on sludge handling, and the ERT noted that an MCF_i value of 0.8 was used for anaerobic treatment of sludge for 1988, whereas an MCF_i value of 1 was applied for all the other years of the time series. In response to a further question raised by the ERT during the review, Bulgaria explained that the use of the MCF_i value of 1 for 1989–2012 was a technical error and that 0.8 should be used for the entire time series. The ERT confirms the adequateness of the MCF_i value of 0.8 for anaerobic systems according to the 2006 IPCC Guidelines and recommends that Bulgaria reconsider the use of the MCF_i value, recalculate emissions if necessary, and enhance its QC activities.

83. Bulgaria considered food and beverage, pulp and paper, organic chemicals and textiles for estimating emissions from industrial wastewater, as these industries have the

greatest potential for CH_4 emissions. In response to a question raised by the ERT during the review, Bulgaria provided information on the MCF_j and COD (food and beverages) values used. In order to increase transparency, the ERT recommends that Bulgaria include this information, in particular the values used for COD per industrial wastewater type, in its NIR. Moreover, Bulgaria mentioned in its NIR, and confirmed during the review, that emissions from industrial wastewater discharged into the centralized sewer are included in the emissions from domestic wastewater. The ERT recommends that Bulgaria include more detailed information on the consideration of industrial wastewater under domestic and commercial wastewater (approach, amounts, etc.) in its next annual submission.

3. Non-key categories

Wastewater handling – N_2O

84. Bulgaria has reported N_2O emissions from human sewage under this category and under agricultural soils (N_2O from sludge spreading). The previous review report recommended that Bulgaria investigate whether the N input applied to agricultural soils is excluded from its reporting in the waste sector, to prevent double counting of emissions. As this has not been addressed in the NIR and could not be clarified during the review, the ERT reiterates the recommendation made in the previous review report that Bulgaria investigate the possible double counting of N_2O emissions from sludge spreading on agricultural soils and from wastewater handling, and include all the relevant information in the NIR.

Waste incineration – CO_2, CH_4 and N_2O

85. Bulgaria reported in its NIR that emissions from this category decreased by 71.2 per cent between 2004 (99.19 Gg CO_2 eq) and 2012 (28.60 Gg CO_2 eq). In response to a recommendation made in the previous review report, Bulgaria elaborated on the trend in the NIR by including information on the decrease in emissions for 2010 and 2011 and the increase in 2012. In addition, Bulgaria calculated the biogenic CO_2 emissions and reported them as a memo item in CRF table 6.C. The ERT commends Bulgaria for these improvements.

Other (waste) – CH_4 and N_2O

86. Bulgaria reported emissions from biological treatment of solid waste (composting) for the years 2011 and 2012 following the methodology and using the default EFs from the 2006 IPCC Guidelines. Bulgaria reported the notation key "NO" for all the other years. In response to a question raised by the ERT during the review on whether or not this activity occurred prior to 2011, Bulgaria explained that composting has only been regulated since 2012 with the adoption of the new waste management law and that three composting facilities have recently been built. The ERT encourages Bulgaria to include the information on composting provided to the ERT during the review in the NIR.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

87. Table 6 provides an overview of the information reported and parameters selected by Bulgaria under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Issue	*Expert review team assessment, if applicable*	*Findings and recommendations*
Assessment of the Party's reporting in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1	Sufficient	
Activities elected under Article 3, paragraph 4, of the Kyoto Protocol	None	
Period of accounting		Commitment period accounting
Party's ability to identify areas of land and areas of land-use change in accordance with paragraph 20 of the annex to decision 16/CMP.1	Sufficient	

88. Section G.1 includes the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines and decisions 15/CMP.1 and 16/CMP.1. In accordance with decision 6/CMP.9, Parties will begin reporting of KP-LULUCF activities in the submissions due by 15 April 2015 using revised CRF tables, as contained in the annex to decision 6/CMP.9. Owing to this change in the CRF tables for KP-LULUCF activities, and the change from the first commitment period to the second commitment period, paragraphs 89–94 below contain the ERT's assessment of the Party's adherence to the current reporting guidelines and do not provide specific recommendations for reporting these activities in the 2015 annual submission.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

89. In KP-LULUCF table NIR-1, Bulgaria has used the notation key "NR" (not reported) for the dead wood pool; however, in table 5(KP-I) A.1.1 the notation key "NO" is reported for the same pool. In response to a question raised by the ERT during the review, Bulgaria indicated that the correct notation key is "NO". The ERT reiterates the recommendation made in the previous review report that Bulgaria apply notation keys consistently in the CRF tables for the dead wood pool.

90. As described above (see para. 68) the method for estimating carbon loss in living biomass on lands subject to afforestation/reforestation was not transparently described in the NIR. The ERT accepts the supplementary description and data provided by the Party during the review, and recommends that Bulgaria transparently describe, in the NIR, how the carbon loss on lands subject to afforestation/reforestation is estimated.

91. For the estimates of carbon stock changes in mineral soil for other land converted to forest land, Bulgaria assumed a value of zero (0 t C/ha) for the reference carbon stock in mineral soil of the other land (NIR section 11.3.1.5). The ERT notes that

afforestation/reforestation cannot occur on bare rocks. Land suitable for afforestation and reforestation is likely to have soil containing carbon. The ERT considered that the zero assumption potentially overestimates the carbon stock changes in mineral soils for afforestation and reforestation on other land converted to forest land and added this to the list of potential problems and further questions raised by the ERT.

92. In response to the list of potential problems and further questions raised by the ERT, Bulgaria developed a new value (69.0 t C/ha) based on IPCC default values and recalculated the carbon stock changes in mineral soil for afforestation/reforestation on other lands. The ERT agrees with the revised estimate provided and commends Bulgaria for its commitment to develop a country-specific value for reference soil carbon stock under other land use.

Deforestation – CO_2

93. In table 257 of the NIR, the value of net CO_2 emissions for forest land converted to settlements (34.12 Gg CO_2) is not reported consistently with the value in CRF table 5(KP-I) A.2 (98.91 Gg CO_2). In response to a question raised by the ERT during the review, Bulgaria indicated that there is an error in table 257 of the NIR. The ERT recommends that Bulgaria enhance its QC activities on the information reported.

94. Following a recommendation by the previous ERT, Bulgaria used forest carbon stock in living biomass per hectare to estimate carbon emissions of living biomass from deforestation for the period 1990–2010, and the Party provided a transparent description of the data and methodology used in the NIR. The ERT commends Bulgaria for the efforts made in addressing this recommendation.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

95. Bulgaria has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[8] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR. The ERT noted that Bulgaria had not fully implemented recommendations made in the previous SIAR regarding the availability of public information, the provided URL that was broken and the information on Article 6 activities which was only provided aggregated by year. The ERT reiterates the recommendations made in the SIAR that the Party provide public information in accordance with the annex to 13/CMP.1 paragraphs 45, 46, 47 and 48 (recommendations P2.4.2.1-4 in the SIAR part 2).

96. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88 (a–j). No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

[8] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol

97. Bulgaria has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

98. Table 7 shows the accounting quantities for KP-LULUCF as reported by Bulgaria and the final values after the review.

Table 7

Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO_2 eq

	2014 annual submission[a]		
	As reported	*Revised estimates*	*Final accounting quantity*[b]
Afforestation and reforestation			
Non-harvested land	–4 222 763	–4 139 409	–4 139 409
Harvested land	NO		NO
Deforestation	575 536		575 536
Forest management	NA		NA
Article 3.3 offset[c]	NA		NA
Forest management cap[d]	NA		NA
Cropland management	NA		NA
Grazing land management	NA		NA
Revegetation	NA		NA

Abbreviations: CRF = common reporting format, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] The values included under the 2014 annual submission are the cumulative accounting values for 2008, 2009, 2010, 2011 and 2012, as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2012.

[b] The "final accounting quantity" is the quantity of Kyoto Protocol units that the Party shall issue or cancel under each activity under Article 3, paragraph 3, and paragraph 4, if relevant, based on the final accounting quantity in the 2014 annual submission.

[c] "Article 3.3 offset": for the first commitment period, a Party included in Annex I to the Convention that incurs a net source of emissions under the provisions of Article 3, paragraph 3, of the Kyoto Protocol may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[d] In accordance with decision 16/CMP.1, annex, paragraph 11, for the first commitment period only, additions to and subtractions from the assigned amount of a Party resulting from forest management under Article 3, paragraph 4, of the Kyoto Protocol after the application of decision 16/CMP.1, annex, paragraph 10, and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

99. Based on the information provided in table 7 for the activity afforestation and reforestation, Bulgaria shall: for non-harvested land, issue 4,139,409 removal units (RMUs) in its national registry; and for harvested land, neither issue nor cancel any units in its national registry.

100. Based on the information provided in table 7 for the activity deforestation, Bulgaria shall cancel 575,536 assigned amount units, emission reduction units, certified emissions reduction units and/or RMUs in its national registry.

Calculation of the commitment period reserve

101. Bulgaria has reported its commitment period reserve in its 2014 annual submission. Bulgaria reported its commitment period reserve to be 305,228,132 t CO_2 eq based on the national emissions in its most recently reviewed inventory (61,045,626 t CO_2 eq). The ERT notes that based on the submission of revised emissions estimates by Bulgaria during the review of the 2014 annual submission, the commitment period reserve changed, and the new commitment period reserve is reported as 306,295,417 t CO_2 eq based on the national emissions in its most recently reviewed inventory (61,259,083 t CO_2 eq). The ERT agrees with this figure.

3. Changes to the national system

102. Bulgaria reported that there are no changes in its national system since the previous annual submission. The ERT concluded that Bulgaria's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

103. Bulgaria reported that there are changes in its national registry since the previous annual submission. The Party described all the changes in its NIR, including a change of contact name and changes affecting EU ETS functionality. The ERT concluded that, taking into account the confirmed changes in the national registry, Bulgaria's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

104. Consistent with paragraph 23 of the annex to decision 15/CMP.1, Bulgaria provided information relating to how it is striving, under Article 3, paragraph 14, of the Kyoto Protocol, to implement its commitments in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention.

105. Bulgaria considers that there are no significant adverse impacts of its climate change policies as they are focused on renewing old technologies and improving energy efficiency as well as implementing the EU ETS. Bulgaria is also introducing legislation to reduce market imperfections, tax and duty incentives and subsidies in GHG-emitting sectors, taking into account market conditions.

106. Bulgaria reported that there are no changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. The ERT concluded that the information provided continues to be complete and transparent.

III. Conclusions and recommendations

A. Conclusions

107. Table 8 summarizes the ERT's conclusions on the 2014 annual submission of Bulgaria, in accordance with the Article 8 review guidelines.

Table 8
Expert review team's conclusions on the 2014 annual submission of Bulgaria

Issue	*Expert review team assessment*	*Paragraph cross-references for identified problems*
The ERT concludes that the inventory submission of Bulgaria is complete with regard to categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1988–2012		
Annex A sources[a]	Complete	
LULUCF[a]	Complete	
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of Bulgaria has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	
The Party's inventory is in accordance with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF	Yes	
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	
Party has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did the Party provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	Yes	

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team,

IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Revised 1996 IPCC Guidelines, the IPCC good practice guidance or the IPCC good practice guidance for LULUCF).

B. Recommendations

108. The ERT identified the issues for improvement listed in table 9. All recommendations are for the next annual submission, unless otherwise specified.

Table 9
Recommendations identified by the expert review team

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
Cross-cutting	Inventory planning	Fully document the use and QA/QC of the data from branch business associations and the EU ETS in the NIR	No	13
		Include general QA/QC and sector-specific QA/QC activities in the QA/QC plan by referencing the appropriate documents	No	14
	Inventory preparation	Clearly describe in the NIR the methods and assumptions used for the uncertainty analysis	No	16
Energy	Comparison of the reference approach with the sectoral approach and international statistics	Provide a brief explanation of the cause of the difference between the two approaches in the documentation box of CRF table 1.A(c)	No	24
	Stationary combustion: liquid and solid fuels – CO_2, CH_4 and N_2O	Include in the NIR the explanation provided to the ERT during the review on the methods to produce steel to improve the transparency of the emission estimates for iron and steel production	No	27
	Road transportation: liquid fuels – CO_2	Conduct a tier 2 estimate of CO_2 emissions from gasoline based on country-specific EFs (CO_2 emissions resulting from the COPERT model may serve to cross-check the tier 2 estimates)	No	28
	Coal mining and handling: solid fuels – CO_2 and CH_4	Develop a country-specific EF for fugitive CH_4 emissions from underground coal mining and handling to enable it to apply a higher-tier method to this category	No	30

Sector	*Category cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
	Civil aviation: liquid fuels – CO_2, CH_4 and N_2O	Apply the appropriate definitions for the notation keys when reporting emissions in the CRF tables	No	31
Industrial processes and solvent and other product use	Sector overview	Revise the chapter in the NIR on industrial processes and include additional background information for these categories, aggregating information to protect confidential information as necessary, to increase the transparency of the emission estimates	Yes	34
		Strengthen the QC activities to ensure that information included in the NIR is consistent with the data reported in the CRF tables and review, and as appropriate revise, the use of notation keys in the industrial processes sector	Yes	35
	Lime production – CO_2	Provide in the NIR the method and source used for estimating the ratio between quicklime and dolomitic lime production	Yes	36
	Other (mineral products) – CO_2	Assess whether the accuracy of the adjusted IEFs based on the newly available data from the EU ETS applied for the period 2009–2012 would be more accurate than the EFs applied prior to 2008 and, if appropriate, conduct the necessary recalculations based on the applied EFs for the period 1988–2007	Yes	37
	Ammonia production – CO_2	Report more information to justify the decrease in emissions from ammonia production and include in the NIR the explanation provided to the ERT during the review	No	38
		Clearly explain in the NIR the source of the equation used for the CO_2 emission estimate and clearly report how emissions of CO_2 recovered for use in urea production are accounted for in the inventory	Yes	39
	Iron and steel production – CO_2	Report more information under this category	No	40
		Use the notation key "IE" for pig iron production and coke production	Yes	41
		Improve transparency by providing more information about methodologies, parameters and assumptions used for emission estimates under this category	Yes	44

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
	Carbide production – CO_2	Investigate the quantity of anthracite used as a reducing agent and deduct these emissions from the energy sector	Yes	45
	Other (chemical industry) – CH_4	Include information in the NIR for this category on AD sources, EFs and associated parameters, methods and assumptions to ensure that all estimates can be independently verified	Yes	46
	Ferroalloy production – CO_2	Improve the accuracy of reporting by recalculating emissions for this category by applying default EFs based on ferroalloy type and using available AD	No	47
Agriculture	Sector overview	Include all relevant information regarding recalculations in the NIR	Yes	49
		Improve QA/QC procedures in the agriculture sector	No	52
	Enteric fermentation – CH_4	Provide in the NIR detailed information on the AD used and the emission calculation method applied for this category, especially for young cattle	Yes	53
	Manure management – CH_4 and N_2O	Justify the use of an MCF of 90 per cent, and make efforts to develop a country-specific value	Yes	54
		Investigate the Nex values further and provide additional transparent documentation that the values are appropriate estimates for conditions in Bulgaria	No	56
		Present in detail in the NIR the relevant and scientifically justified information regarding the country-specific value of VS for swine	No	57
	Indirect soil emissions – N_2O	Use country-specific parameters to estimate N_2O emissions from ammonia volatilization and report them under the indirect soil emissions category	Yes	60
	Field burning of agricultural residues – CH_4 and N_2O	Provide a justification for the values used in the CRF tables or use the values from the IPCC good practice guidance, and correct the inconsistency identified	No	62
LULUCF	Sector overview	Include the information on private forests provided to the ERT during the review in the NIR to enhance transparency	No	66

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
	Forest land remaining forest land – CO_2	Apply a higher-tier method to estimate emissions and removals in the dead organic matter and soil carbon pools	Yes	67
	Land converted to forest land – CO_2	Include a detailed description of the method and data used for calculating living biomass for cropland and grassland in the NIR	No	68
		Develop a country-specific value for the reference soil carbon stock in other land, and estimate the carbon stock changes in mineral soil for other land converted to forest land using the new value	No	69
Waste	Sector overview	Enhance QC activities in the waste sector and include more adequate information on the recalculations	No	72
	Solid waste disposal on land – CH_4	Make further efforts to increase transparency by reporting on the industrial waste amounts and the types considered	No	74
		Clarify what half-life values are used in the calculation	No	75
	Wastewater handling – CH_4	Improve the accuracy of reporting and QA/QC activities to avoid inconsistencies	No	78
		Provide more information on the recalculations performed to improve transparency		79
		Correct the notation key used for CH_4 recovery from sludge from "NO" to "IE", and clearly indicate where the respective emissions are included	No	80
		Improve transparency and provide background information on domestic sludge treatment in the NIR	Yes	81
		Reconsider the use of the MCF_1 value, recalculate emissions if necessary and enhance QC activities	No	82
		Include the values used for COD per industrial wastewater type in the NIR	No	83
		Include more detailed information on the consideration of industrial wastewater under domestic and commercial wastewater (approach, amounts, etc.)	No	83

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
	Wastewater handling – N_2O	Investigate the possible double counting of N_2O emissions from sludge spreading on agricultural soils and from wastewater handling, and include all relevant information in the NIR	Yes	84
KP-LULUCF	Afforestation/ reforestation – CO_2	Apply notation keys consistently in the CRF tables for the dead wood pool	Yes	89
		Transparently describe in the NIR how the carbon loss on lands subject to afforestation/reforestation is estimated	No	90
	Deforestation – CO_2	Enhance the QC activities on the information reported	No	93
National registry	Standard electronic format tables and reports from the national registry	Provide public information in accordance with the annex to 13/CMP.1 paragraphs 45, 46, 47 and 48 (recommendations P2.4.2.1–4 in the SIAR part 2)	No	95

Abbreviations: AD = activity data, COD = chemical oxygen demand, CRF = common reporting format, EF = emission factor, ERT = expert review team, EU ETS = European Union Emissions Trading System, IE= included elsewhere, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land-use, land use change and forestry, MCF = methane conversion factor, MCF_1 = methane correction factor, Nex = nitrogen excretion rate, NIR = national inventory report, NO = not occurring, QA/QC = quality assurance/quality control, SIAR = standard independent assessment report, VS = volatile solids.

IV. Questions of implementation

109. No questions of implementation were identified by the ERT during the review.

Annex I

Information to be included in the compilation and accounting database

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2012, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	305 228 132	306 295 417		306 295 417
Annex A emissions for 2012				
CO_2	48 363 949			48 363 949
CH_4	7 185 374			7 185 374
N_2O	5 027 889	5 241 346		5 241 346
HFCs	456 408			456 408
PFCs	44			44
SF_6	11 963			11 963
Total Annex A sources[c]	**61 045 626**	**61 259 083**		**61 259 083**
Activities under Article 3, paragraph 3, for 2012				
3.3 Afforestation and reforestation on non-harvested land for 2012	−1 109 806	−1 093 432		−1 093 432
3.3 Afforestation and reforestation on harvested land for 2012	NO			NO
3.3 Deforestation for 2012	98 911			98 911
Activities under Article 3, paragraph 4, for 2012[d]				
3.4 Forest management for 2012				
3.4 Cropland management for 2012				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2012				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2012				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2011

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2011				
CO_2	53 197 352			53 197 352
CH_4	7 574 957			7 574 957
N_2O	4 798 474	5 010 324		5 010 324
HFCs	410 041			410 041
PFCs	51			51
SF_6	14 873			14 873
Total Annex A sources[c]	**65 995 748**	**66 207 598**		**66 207 598**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–972 243	–955 615		–955 615
3.3 Afforestation and reforestation on harvested land for 2011	NO			NO
3.3 Deforestation for 2011	72 364			72 364
Activities under Article 3, paragraph 4, for 2011[d]				
3.4 Forest management for 2011				
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	47 721 368			47 721 368
CH_4	7 317 578			7 317 578
N_2O	4 847 776	5 042 680		5 042 680
HFCs	372 203			372 203
PFCs	44			44
SF_6	13 069			13 069
Total Annex A sources[c]	**60 272 038**	**60 466 943**		**60 466 943**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–829 259	–812 384		–812 384
3.3 Afforestation and reforestation on harvested land for 2010	NO			NO
3.3 Deforestation for 2010	117 440			117 440
Activities under Article 3, paragraph 4, for 2010[d]				
3.4 Forest management for 2010				
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	45 416 809			45 416 809
CH_4	7 308 099			7 308 099
N_2O	4 640 653	4 829 460		4 829 460
HFCs	349 716			349 716
PFCs	16			16
SF_6	9 974			9 974
Total Annex A sources[c]	**57 725 268**	**57 914 075**		**57 914 075**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–696 226	–679 128		–679 128
3.3 Afforestation and reforestation on harvested land for 2009	NO			NO
3.3 Deforestation for 2009	64 680			64 680
Activities under Article 3, paragraph 4, for 2009[d]				
3.4 Forest management for 2009				
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 14
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	53 707 768			53 707 768
CH_4	7 674 956			7 674 956
N_2O	5 129 057	5 298 569		5 298 569
HFCs	321 319			321 319
PFCs	IE, NA, NO			IE, NA, NO
SF_6	9 600			9 600
Total Annex A sources[c]	**66 842 700**	**67 012 212**		**67 012 212**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–615 229	–598 850		–598 850
3.3 Afforestation and reforestation on harvested land for 2008	NO			NO
3.3 Deforestation for 2008	222 140			222 140
Activities under Article 3, paragraph 4, for 2008[d]				
3.4 Forest management for 2008				
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere, NA = not applicable, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Bulgaria 2014. Available at <http://unfccc.int/resource/docs/2014/asr/bgr.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2014. Available at <http://unfccc.int/resource/webdocs/sai/2014.pdf>.

FCCC/ARR/2013/BGR. Report of the individual review of the annual submission of Bulgaria submitted in 2013. Available at <http://unfccc.int/resource/docs/2014/arr/bgr.pdf>.

Standard independent assessment report template, parts 1 and 2. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Detelina Petrova (Executive Environment Agency), including additional material on the methodology and assumptions used.

Annex III

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management system
BOF	basic oxygen furnace
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COD	chemical oxygen demand
CRF	common reporting format
EF	emission factor
ERT	expert review team
EU ETS	European Union Emissions Trading System
F-gas	fluorinated gas
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
ha	hectare
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
k	methane generation rate constant
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
m^3	cubic metre
MCF	methane conversion factor
MCF_i	methane correction factor
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
Nex	nitrogen excretion rate
NCV	net calorific value
NIR	national inventory report
NO	not occurring
NSI	National Statistical Institute
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change
VS	volatile solids